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Aligning nature conservation and agriculture

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Title: Aligning nature conservation and agriculture: the search for new regimes

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Abstract

In addition to the protection of nature in reserves, known as the land-sparing approach, another strategy is often suggested, the land-sharing approach, which implies the integration of nature protection with other human activities. In particular in Europe a rich variety of sharing approaches have been practiced. Using the theoretical concepts of the multi-level perspective found in transition theory, we will analyze two experimental cases in the Netherlands, in which the development of a sustainable, nature-friendly form of agriculture was attempted. In these experiments new concepts of biodiversity monitoring, self-governance, and agriculture were developed in order to enhance biodiversity and the quality of nature on a regional scale. Our conclusion is that this sharing strategy proves promising, at least in terms of relatively extensive use of agricultural areas. It should, however, not only include sharing of land use but also of responsibilities, knowledge development, aims and means. Moreover, our study reveals that such an approach is possible only if governmental and market structures also change and if it is based on new integrating concepts.

Practical implications

1. Alignment of nature protection and agriculture may contribute to biodiversity goals in semi-natural and cultural landscapes.
2. The multi-level perspective makes it possible to distinguish several dimensions and societal levels that are relevant for understanding the transition to a sustainable and nature-friendly form of agriculture.
3. Alignment of nature protection and agriculture requires expertise with respect to agricultural regimes and agriculture-nature interactions, as well as spaces for experiments.
4. Knowledge building and practices concerning nature-friendly agriculture may be considered a form of inclusive ecological restoration.

Introduction

Agriculture is seen as one of the main threats to biodiversity (CBD 2006). Environmental effects concern habitat destruction or fragmentation, pollution by nutrients and pesticides, and drainage. For example, many European farmland bird populations decreased with at least 50% during the last decades, including the Northern lapwing (*Vanellus vanellus*) and Eurasian skylark (*Alauda arvensis*) (European Environmental Agency 2015). The dominant response to these threats are preservation and conservation and more recently, restoration of nature reserves. However, the relationship between agriculture and conservation has attracted new attention in recent years in terms of the debate on land sparing and sharing (Green et al. 2005; Kremen 2015). Proponents of land sparing argue for a strong separation of agriculture and conservation, and intensive forms of agriculture in order to create more space for nature. In contrast, land-sharing advocates promote extensive, nature-friendly forms of agriculture, without such a strong separation. However, the distinction between sparing and sharing is often too simplistic, since optimal strategies concerning conservation and food security issues also depend on the kind of species and ecosystems involved, as well as land scale and climate conditions, the rebound effects of land conversion, and political, cultural and economic conditions (Fischer et al. 2014; Phalan et al. 2016).

At present, both strategies are being practiced. North American nature protection organizations have always had a focus on pristine, pre-Columbian nature, implying a preservation or sparing approach. Their European counterparts, however, have developed several approaches in order to conserve semi-natural and traditional, small-scale agricultural landscapes, which can be considered variants of land-sharing strategy (De Klemm & Shine 1996). More recently we are also seeing attempts to integrate conservation and restoration measures with modern forms of agriculture, their value chains, and daily practices (Barbier & Elzen 2012). However, such alignments are not easy to achieve because of the involvement of many different actors, discourses, knowledge domains, and societal constraints.

The alignment of conservation and restoration goals with those of modern agriculture implies the establishment of “hybrid regimes”, in which we find both conservation/restoration and agriculture, as well as new underlying societal institutions. Such transitions are dependent on innovations in science and technology, on the one hand, and societal changes on the other. Scholars from the field of transition science argue that a substantial and sustainable transition and regime change require multiple, synchronized developments on various societal levels (Grin et al. 2010).

In this paper we will apply this “multilevel perspective” to two Dutch cases involving an attempt to reconcile agriculture and nature protection goals. The main aim of our research is to investigate whether these cases can be characterized as promising examples of nature-friendly agriculture – or even as examples of agriculture-friendly forms of nature restoration. Moreover, we will discuss to what extent these cases have the potential to change the current dominant agriculture regime, and under what conditions the merging of nature conservation and agriculture regimes is possible..

Methodology and theoretical framework

According to the multi-level perspective (MLP), regimes are relatively stable institutional configurations enabling management and intervention in social domains such as urban development, agriculture, etc. A regime consists of a variety of procedures, rules, and actors with different discourses and resources as part of a societal network (Stone 1989; Kissling-Näf & Kuks 2004; May & Jochim 2013). Scholars from the fields of science and technology studies, as well as evolutionary economics, add that regime stability, consistency, and change also relate to technological, scientific, and market factors, as is illustrated by mobility and energy transitions (Rip & Kemp 1998; Grin et al. 2010), for example. The term “socio-technological” regime is used to stress such close relationships between technology and society. These authors distinguish four main regime dimensions: policy-making or governance (including actors, procedures, and rules), science, technology and related infrastructures, culture and values, and market and economy.

The regime is considered to be a middle ground between the “niche” and “landscape” levels of societal structures (figure 1). Niches are temporary social spaces shielded against pressures from existing dominant institutions and markets, providing the actors involved (technologists, practitioners, citizens groups) the opportunity to collaborate, experiment, and exchange ideas and experiences. The landscape stands for the characteristics of society as a whole, for example, certain values (freedom, sustainability), scientific paradigms, political views (democracy), economic principles, and often bio-physical conditions such as infrastructures, geographies, and existing urban and nature areas.

According to the MLP, new ideas and practices can best be developed, tested, and nurtured at the niche level. Examples of this are subsidized innovation programs for the development of wind turbines, or seed firm research departments that develop new crop varieties. In general, it is assumed that, when niche results accumulate, the regime will be seriously challenged not only by innovative products, technologies, and scientific insights but also by new governance styles, markets, production chains, norms and values.

As a consequence, if a regime shift takes place, different dimensions and social groups will reconfigure and reintegrate, learning processes will take place, and new networks will be established in a process of co-creation (Regeer & Bunders 2003). Accordingly, innovations may develop further if there is long-lasting ideological, scientific-technical, financial-economic-material, and social-institutional support by relevant actors such as citizen groups, investors, and policy makers (Smith 2007). In this respect the landscape level is relevant, since it not only constrains regime change but may also facilitate and create opportunity windows for niche construction by stressing the need for experimentation and making current regimes receptive to change. The dynamics on the different levels should be considered as a mutual feedback process. Therefore, the landscape may also change through regime and niche dynamics. This usually happens slowly, however, except in cases where there are radical market, political, or ecological disruptions.

An example of regime shift can be found in Dutch water management, which for centuries has been based on the joint responsibility of regional water boards and the central government, assisted by communities of farmers, engineers, and investors. Dykes, canals, and pumps were the main technologies that not only controlled water levels but also led to reclamation of arable land and new polder

landscapes (Zeischka 2007). However, the rise of new societal values, and the threat of climate change, and the accompanying increase in water precipitation, in particular, have replaced that old regime (Raven et al. 2011; Pahl-Wostl et al. 2009). Controlled flooding experiments were started, and natural stream and bank restoration created new natural habitats and facilitated species migration (Van Vossen & Verhagen 2009). These developments have led to a new regime, characterized by new legislation, the recognition of ecological knowledge, and the involvement of citizens and environmentalists (Raven et al. 2011; Schultz van Haegen-Maas Geesteranus 2013).

Regime change may also happen through regime merging, which is especially relevant in our case, where we look for alignment of agriculture and nature conservation or restoration. Flinterman and colleagues (2012) describe how a successful cross-regime innovation involving agriculture and healthcare took place in the Netherlands. It enabled encounters of pioneers from both regimes and led to experimental niches for a potentially new hybrid regime of care farming, in which the farming environment functions as therapeutic mean and where patients help farmers to manage the farm. This regime change was mediated by pressures from the overarching landscape level, that is, the societal call for a more active role on the part of clients to retain good health. This resulted in a window of opportunity for these new farming practices. New regulations, financial support, and institutional frameworks appeared to be important factors, as well as the involvement of new actors and sufficient opportunities to develop new professional routines for cross-over actors, i.e. actors that cross traditional regime boundaries.

Cases

By describing and analyzing two cases, we aim to indicate possibilities for and bottlenecks to regime transition, and to show how conservation and agriculture can be sustainably aligned, challenging current dominant agriculture regimes. In our analysis, we will focus on four dimensions: science and technology, values, policy or governance, and markets. Our two cases, “Overijssel” and “Noordelijke Friese Wouden” (Northern Frisian Woods), are located, respectively, in the Dutch province of Overijssel and the province of Friesland. Both regions are considered less suitable for modern, rationalized agriculture but are appreciated for their physical landscape characteristics. A considerable part of these areas is characterized by rather extensive and small scale forms of agriculture and designated Natural Landscapes with a highly valued biodiversity. For example, in Overijssel we find species such as finger speedwell (*Veronica triphyllos*), love-in-idleness (*Viola tricolor*) and European stonechat (*Saxicola rubicola*), in Friesland for instance pale rose (*Rosa corymbifera*), apple moss (*Bartramia pomiformis*), and common redstart (*Phoenicurus phoenicurus*). Some nature areas are managed by nature organizations. In both regions there are restrictions for farmers but also opportunities for them to realize tourism-based incomes and to make use of subsidy schemes for extensive nature-friendly agriculture (Hoekstra et al. 2010; Van der Ploeg et al. 2010).

One important reason for choosing these cases was that in both regions from 2008 onwards, experimentation took place using new practices and new coalitions between farmers, local entrepreneurs, and NGOs. Their aim was to investigate new spaces for sustainable innovations in local agricultural practices as a challenge to the existing agricultural regime (Van der Ploeg et al. 2010;

Pinxterhuis & Caron-Flinterman 2010; Drooge & Gerritsen 2010; Veldkamp et al. 2009). In both cases, project teams were established consisting of local actors assisted by scientists from Wageningen University and Research (WUR), governmental organizations, and environmental consultancies. The project teams supervised thematic workgroups consisting of local stakeholders such as farmers and retail entrepreneurs. The workgroups were actually trying to develop new sustainable practices in the agricultural value chain.

The authors of this paper were involved as external and independent observers in both projects during the period 2009-2013. Their role was to provide the project team participants with critical observations in order to improve the process (not the products). Therefore this research methodology may be classified as “participatory observation,” with a focus on monitoring and evaluation. The authors enjoyed an independent position, since they were hired and funded by the Athena Institute of the Free University Amsterdam, which had received the funding for process assessment from the initiating stakeholders of these projects.

The authors had access to all meetings of the project teams, to workshops and field trips, to internal documents, and to project participants for interviews, and they were also involved in the post-evaluation procedure of the projects, where their findings were discussed with the members of the project groups. Furthermore, documents from both before and after the projects were assessed. Finally, the findings were compared with publications on these and former projects.

Results

In order to put the projects into context, we first sketch Dutch agriculture, which seems to be a very successful enterprise. In spite of its small size – with 17 million inhabitants, 186,000 of whom work in agriculture – the country is the second largest exporter of agricultural products (CBS 2016). This success is based on the intensive and specialized character of the sector, and the strong links with governmental institutions, farmers organizations and special agriculture-oriented schools, scientific institutions, banks, and industry (Karel & Seegers 2016).

However, as in many other Western countries, this dominant agricultural regime has been criticized since the early 1970s because of serious well-known downsides: its impact on the environment, biodiversity, animal welfare and human health, the loss of employment, and unbalanced power and trade relationships. As early as the 1970s, alternative practices such as organic farming, slow food initiatives, and regional or urban markets started, and new coalitions with citizens, scientists, and farmers were established (Barbier & Elzen 2012; Friedland 2010; Parvathi & Waibel 2013; Wiskerke & Van der Ploeg 2004). The two projects we analyzed fit into this critical tradition.

Niche development in the project Echt Overijssel

The project in Overijssel, called Echt Overijssel (Real Overijssel [EO]), was initiated by parties already working on sustainable agriculture projects (Pinxterhuis et al. 2008). These comprised the Province of Overijssel, the experimental demonstration organic farm Aver Heino, researchers from Wageningen University and Research, the main Dutch nature management organization Natuurmonumenten (800,000 members), and the Dianthus Foundation, a regional organization of organic farmers and retailers. The project was supported by LTO (Land en Tuinbouw Organisatie), which is the largest Dutch organization of farmers, along with the Ministry of Housing, Spatial Planning and Environment, and the Ministry of Agriculture, Nature and Food.

The goals were to create 1) higher levels of biodiversity, landscape and environmental quality, 2) regionally closed nutrient cycles, 3) new regional economic activities and products, and 4) new coalitions of farmers, nature conservationists, local entrepreneurs, and scientists (Anonymous, 2008). About 25 farmers from the region were recruited for the project, and supported by the project team involved. Because of the diversity of the farms, and the motives of the farmers and project team members, it took some time, but after one year three workgroups were established, focusing on nutrient cycles (“Nutrients” workgroup), on agrobiodiversity (“Biodiversity” workgroup), and on new products and markets (“Market” workgroup), whose shared aim was to develop profitable environmental friendly products and services.

The aim of the “Nutrients” workgroup was to shorten nutrient cycles by reducing the import of feed from outside the region, and also to reduce energy and materials use through the use of regional sources. Because it was uncertain whether the farmers could produce sufficient feed of high quality, this group started experimentation with new types of animal food: grass-clover and other mixtures. The researchers involved tested local grain mixtures as feed for cattle, and a new method was developed to assess the farmers’ efforts at nutrient cycling. The experiments showed that, for a number of farms, this new system was successful and could significantly reduce the import of animal feed from outside the region. More than 80% of the feed could be produced in the region (Pinxterhuis & Caron-Flinterman 2015; Holster et al. 2013). Next, farmers started to discuss the possibility of using Natuurmonumenten land for this kind of feed production in an extensive way. In the course of the project, this goal was found to be achievable. However, Landschap Overijssel, the main regional nature organization, was reluctant because it feared that these practices did not fit with its nature conservation goals.

In the “Biodiversity” workgroup, farmers collaborated with nature conservationists and researchers from the Louis Bolk Institute, an independent research center for organic farming. Their aim was to bring about “ridge cultivation” of wheat on fields owned by Natuurmonumenten. In ridge cultivation crops grow on elongated relatively high ridges. This improves the quality of the soil and the soil fauna, while it creates room for wildflowers between the ridges. At the end of the project the management of the fields was handed over to the farmers of this group. In addition, farmers could use the land from Natuurmonumenten to graze their cattle and allow their pigs to forage, which probably improved both the quality of the meat and the vegetation structure of the natural areas. In line with the aim of closing nutrient cycles and to make the results more visible to the public, a local bakery produced a biscuit from this grain (Pinxterhuis & Caron-Flinterman 2015; Holster et al. 2013).

The “Market” workgroup, mostly organic farmers, established a foundation called “Nature Farmers,” whose goal was to set up new local production chains in collaboration with local shop keepers and supermarkets. The foundation members produced beef, honey, herbs, and dairy products for the local market. In order to reduce CO₂ emissions, they developed a local solar energy initiative. Experts from consultancy CLM (Centrum voor Landbouw and Milieu [Centre for Agriculture and Environment]), developed the “Gaia yardstick” to monitor wild plants and animals, along with old breeds of cattle and traditional crops. By using this yardstick farmers were able to learn, understand, assess and monitor local agrobiodiversity. Among the about 100 species of the yardstick are the western yellow wagtail (*Motacilla flava*), Old World swallowtail (*Papilio Machaon*), and awned vernalgrass (*Anthoxanthum aristatum*). Based on this, a certification system was developed for farmers who could show that at least 25% of their land could be labeled a “natural area”. At the end of the project, the group founded a national network of Nature Farmers (Holster et al. 2013).

During the project, annual meetings for the participants were organized around key issues in order to learn and reflect, to eradicate barriers between the participants, and to build up a shared identity (Pinxterhuis & Caron-Flinterman 2015). At the end of the project, the “Green Triangle” was advanced as the overarching concept that connected the three main themes of biodiversity, closed nutrient cycles, and local markets. Furthermore, there were shared activities, such as product development, monitoring, energy production, and developing cycling routes as part of branding the region, which connected the different workgroups.

From our observations, and on assessing the project’s midterm reports and meeting minutes, it appeared that keeping the different participants on track required strong, intensive supervision by the project team, since the participants’ interest in the complex and abstract key issues of the project was often challenged by the farmers’ daily, practical issues and interests (Swart & Van der Windt 2014). Nevertheless, the project succeeded in making presentations about the outcomes, presentations which proved to be of interest to others, such as agricultural experts, farmers, and regional stakeholders, along with the general public. For instance, the project resulted in a website and a movie and well-visited presentations at the main Dutch organic farming meeting (BIOVAK). After the project, much of the work could be continue and further developed through the Nature Farmers foundation and new projects set up by the initiators of the project. In this sense, a new network was established.

In conclusion, the project was able to develop as a result of workgroup activities that involved new practices, experimentation, products, and new networks, and approaches that stressed over-arching identity concepts. The concept of agrobiodiversity was connected to farm product quality, to local markets, and to regional branding by making use of the Gaia yardstick for product certification and the development of an assessment procedure for nutrient cycling. The use of old breeds of cattle and new mixtures of grains contributed to more efficient nutrient cycling or to agrobiodiversity. The broader and practical meaning of biodiversity integrated the perspectives of scientists, nature conservationists, and farmers. Moreover, the project made it possible to conserve and restore the old agricultural landscape with old races of cattle, low external nutrient input, and high biodiversity levels.

Niche development in the project Noordelijke Friese Wouden

The project Noordelijke Friese Wouden (Northern Frisian Woods [NFW]) was initiated by a group of a few hundred farmers, mostly dairy farmers, who were already united in the farmers' organization "Society of the NFW". Many of these farmers had already worked together, supported by scientists from Wageningen University and Research in "environmental cooperatives", that is, groups of farmers looking for profitable, nature-friendly and environmentally friendly forms of agriculture. Key issues, already put forward by forerunners of the NFW project, were nitrogen release reduction by nitrogen cycling, meadow bird protection, hedgerow management, and self-governance (Stuiver et al. 2003). The project was supported by the province of Friesland, several Frisian municipalities, the Ministry of Housing, Spatial Planning and Environment, the Ministry of Agriculture, Nature and Food, the main Dutch farmer's organization LTO, the Frisian Water Board, and the main Frisian environmental organization Friese Milieufederatie, along with some consultants (Oostindie et al. 2010).

The project's aim was to contribute to a fundamental transition of agriculture by establishing regional collaboration in order to integrate agriculture and non-agricultural activities, and to adapt the application of national and EU policy to regional conditions. Moreover, its goal was to develop and apply innovative interactive forms of knowledge creation, using sustainability, self-governance, and regional economy as key concepts (Transforum 2007; Van der Ploeg et al. 2010; Van Drooge & Gerritsen 2010).

The project team consisted of NFW-representatives and scientists as well as transition, management, monitoring, and communication experts. After several regional meetings with relevant stakeholders, eight workgroups were formed in 2009. The "Pellets" workgroup aimed to make the nature-friendly management of local hedgerows more profitable and began experimentation with wood chopping and pellets production for fuel and shed litter (Van Drooge et al. 2010). The "Walden milk" workgroup developed a business plan for regional and nature-friendly "Walden milk," which contains more healthy fatty acids as compared to conventional milk (Van Drooge & Domhof 2010).

The "Branding" workgroup developed initiatives for framing the region as a small-scale, nature-friendly agricultural area by making use of the recently attributed National Landscape status of the area (Van der Lijn & Domhof 2010). The "Nutrient Recycling" workgroup developed guidelines and a certification policy for a nutrient management system, based on experiments of about 60 farmers. This system focuses on several steps in nutrient cycling: improved use of roughage and fertilizers, better manure quality, improved grass land management, the production of low-protein silage, and a high fibre diet, along with flexible regional manure management (Stuiver et al. 2010).

Four workgroups focused on regional landscape management and planning. The "Monitoring" workgroup developed a practical water-plant checklist (Zwart & Domhof 2010). This list enables farmers to assess the eutrophication level of the water and includes among others water soldiers (*Statoties aloides*), European bur-reed (*Sparganium emersum*), and frogbit (*Hydrocharis morsus-ranae*). The "Self-governance" workgroup worked on a new governance structure made up of regional policy bodies with the authority to apply national and EU nature-management subsidy rules for the management of

meadow birds and the patchwork-like landscape in this area (Zwaan et al. 2010). The two other workgroups worked on “Improvement of regional cooperation” and “Landscape-oriented farm design”.

During the project several meetings were organized to acquire and exchange scientific and other information. The project team and workgroups were therefore strongly supported by scientists and consultancies. This resulted in a number of science-based, practical approaches to sustainable agriculture and wildlife-friendly management. Our observations indicated that it was hard to keep all the participants cooperatively on track, probably due to the wide variety of themes. The active involvement of the Society of the NFW, and intensive and long-lasting scientifically informed coaching was needed.

Little attention was paid to identity building, since the project rested on previous projects that had already generated in this region widely accepted concepts of “sustainable farming and self-governance” and “integrating biodiversity, markets, and nutrient cycling through cooperation” (Van der Windt & Swart 2010). These concepts were made more explicit and, in the end, presented in a high-quality brochure together with the results of the workgroups (Oostindie et al. 2010). Existing contacts were used to communicate the results of the project to other parties such as the provincial government. After this project, most of the projects were continued under the auspices of the Society of the NFW, with support from the province of Friesland.

The Frisian project resulted in the conservation and restoration of the old agricultural landscape with its characteristic hedgerows, high levels of meadow birds and many pingo ruins. One of the results of the restoration of the hedgerows is the population growth of the red-backed shrike (*Lanius collurio*). On several places restoration of peat could take place because of the increase of the ground water level (Tuinstra et al. 2014)

Dimensions

We may consider both projects to be examples of niche construction, since they guaranteed shielded spaces for local groups with various backgrounds. The development of new ideas, products, and procedures was facilitated by several experts and process managers, and was able to thus be tested, developed, and nurtured. In order to find out how it might affect a regime change, we considered some regime dimensions and the effects on nature:

- *Science and technology.* Both cases demonstrated an important role for scientists from the Wageningen University and Research (WUR). They contributed to experimentation especially on nutrient cycling and on new governance concepts. Previous to the NFW project, WUR scientists had already been involved in the Frisian region, stimulating the integration of nature conservation, environmental protection, agriculture, and participation (Roep et al. 2003; Stuiver et al. 2003). However, during this NFW project, several of these scientists encountered problems aligning their knowledge and insights with the aims and needs of the farmers (Amstel & Brink 2008; Gerritsen et al. 2013; Spekkink et al. 2013). In contrast, non-WUR specialized experts appeared to be rather successful in assisting several workgroups, for example, “Pellets,” “Walden milk,” and “Landscape-oriented farm design”.

The role of the WUR was also problematic in the EO project when this university decided to close its experimental demonstration of organic farming, Aver Heino, halfway the project. This limited the possible input on cattle farming by WUR researchers. In contrast, contributions of expertise by the CLM and other consultancies appeared to become more important during the project. For example, the Gaia yardstick developed by CLM appeared to be a very practical tool for assessing biodiversity. In addition, the agricultural-ecological knowledge from the private Louis Bolk Institute could be easily applied in the project, for example measuring the biodiversity effects of ridging cultivation. Thus scientific-technological innovation took place with help from the university in both cases, but it was sometimes difficult to link university knowledge to practical problems. Non-university research institutions were rather successful in assisting the workgroups in both projects.

- *Governance.* Both projects explored new governance practices. In the EO project, new arrangements with new distributions of responsibilities and extensive forms of regional agriculture were applied: farmers began producing in a more nature-friendly way, and nature organizations allowed farmers to manage their nature reserves.

In the NFW project, existing governmental structures were challenged even more. Stronger collaboration among farmers, the local water board, and environmental organizations was achieved. The national government has since then approved self-governance by farmers on an experimental basis, which implies temporary deviances from legislative and financial regulations regarding nature management. Because farmers were involved in the monitoring process, and because of the nature certification of the products, they felt responsible for maintaining and improving of biodiversity levels.
- *Values.* In both projects, statements of values were formulated indicating the need for integration of agriculture and nature conservation, the protection of the environment, the value of region-based economies, and the value of self-governance, all in the context of sustainability. However, these statements of values were rarely if at all discussed within the projects; instead, they were seen as a starting point or background by participants, although several times tension arose regarding the question of whether and to what extent agriculture and conservation could really be combined. Thus value orientation in terms of both nature and agriculture was not explicitly discussed as an abstract principle but rather came to the fore in the form of new practice, knowledge, and social networks.
- *Market.* The EO project succeeded in introducing several new products branded under the concept of agrobiodiversity, along with the development of regional markets, taking advantage of the growing demand for organic and regional products. Although relatively few farmers and retailers were involved, they all developed successful business cases and a practice of production without subsidies. However, in several cases the low prices for feed and food limited commercialization. In the NFW project, two workgroups explicitly aimed to commercialize new products: pellets and Walden milk. The project with pellets succeeded and is still running. Commercialization of Walden milk failed because the large dairy company, Friesland-Campina, to which most farmers have to deliver their milk, was reluctant to participate. In conclusion, we see that, in both projects, market penetration was rather modest but might well prove successful in the longer term.

- *Nature quality effects.* Although no systematic research was carried out to assess the quality of nature as a result of these experiments, there are some indirect indications. The new governance styles and monitoring instruments may well improve conditions that will enhance nature quality. The huge number of hedgerows in the Frisian Woods is better protected now, while the meadow bird populations in these areas have developed better than in most other agricultural areas as a result of the nature friendly approach (Staat van de natuur, 2014; Snoo et al. 2016). In the Overijssel region, biodiversity on the participating farms turned out to be at a pretty high level, in terms of plants and insects, about 50% more than in comparable areas (Holster et al. 2014). Further research and monitoring is needed to ascertain causal relations and development over time.

Discussion

From our study it can be concluded that alignment of conservation and agriculture is possible through initiating sustainable agriculture at a local – niche – level, at least in these types of rural areas, and under certain conditions. It requires new concepts and practices, as well as intensive and long-lasting cooperation between conservation, agricultural and other parties, including governmental organizations and researchers. In our cases it took several years to develop new knowledge, new types of governance, new market chains, and new valuation schemes, and to link these in a more or less stable configuration.

But did these changes affect the higher societal - regime - level, and if not, what are the conditions for such changes?

To start with the first question, although we may not expect direct, strong consequences from such projects, there are some indications of post-project and external effects, which may affect the existing regimes. For example, the experimentation with nutrient cycling and the biodiversity monitoring systems in the EO case have been continued in several other projects in the Netherlands (Holster et al. 2014). Also in other provinces groups of Nature Farms have been established, and together they have established a national umbrella organization for Nature Farmers. The province of Overijssel has planned to use the EO project as an inspiring example for its regional policy. Moreover, several nature conservation organizations have decided to begin experimenting with biodiversity cropping (Holster et al. 2013), and at least 50 farmers have continued these practices, supported by the province, nature organizations. Moreover, researchers from the Louis Bolk Institute, CLM, and WUR also continues research in this field of environmentally friendly agriculture.

Another result was that self-management of meadow bird protection, as was experimented in Friesland and which was characterized by taking the whole region as the scale of interest instead of individual farms. It has now been accepted by the Dutch government (Anonymous 2014). More recently, the Dutch government changed legislation so as to enable the implementation of regional biodiversity management plans (De Snoo et al. 2016). The NFW project may thus be seen as a forerunner and driver of these developments. Our cases demonstrate that the changing responsibilities of conservation and restoration to farmers and other users are recognized and stimulated by governmental institutions.

With respect to values, it appears that, apart from organic farmers organizations, biodiversity protection and sustainability has now been applied by two national agricultural organizations, both connected to the NFW Society. The Vereniging tot Behoud van Boer & Milieu (Society for Preservation of Farmers and the Environment) has started to promote nutrient cycling and better manure management, and the Natuurboeren.nl (Society of Farmers for Nature) now coordinates nature-oriented farming by cooperatives, in more than 80,000 hectares in the Netherlands (Anonymous, 2017).

Although product commercialization has proven difficult in these projects, the NFW Society currently aims to revive the case of “Walden milk” in collaboration with the large dairy company Friesland-Campina, World Wildlife Fund, and the Rabobank (Jaarverslag NFW 2014).

Successful regime change not only involves the establishment of new practices but also requires connections to existing networks in order to spread and anchor new ideas and experiences. Involvement and commitment of powerful actors is therefore important. Many actors participated, including the largest national agricultural and nature conservation organizations. However, some relevant actors were absent or hesitant, such as most large food industries and retailers, limiting the possibility for regime change.

Our second question regards the conditions for further destabilization of the old and stabilization of new or merged regimes and whether these are fulfilled. Grin et al (2010) and Flinterman et al (2012) mentions four conditions: there should be pioneers of different regimes who can meet each other to reflect, discuss and experiment, a wide variety of spaces to develop creative practices, novel -financial and institutional- frames and supporting developments at the societal macro or landscape level. .

In the agricultural sector, pioneers with several approaches have been identified, as previously shown. Main agricultural organization LTO proved willing to adapt their approach and to accept nature protection as a part of their responsibility. This is not unique: elsewhere, too, new types of agricultural organizations or other practices arose, also in other countries (Barbier & Elzen 2012). The dominant Dutch nature protection organization Natuurmonumenten turned out to be willing to adapt its conservation strategy and even to hand over conservation responsibilities to farmers, who were then able to integrate agriculture with biodiversity and environmental care. Also in other cases and countries variation and variability among nature protectionists can be found in terms of values, practices, governance, and knowledge (Bohnet & Konold 2015; Long 2015; Skjeggedal et al. 2004; Swart et al. 2001; Van der Windt et al. 2007). Thus with respect to the first conditions, there are pioneers and cross-over actors, there are on-going experiments, there is reflection on values, and there are creative practices. Most of the new practices, governance adaptations, knowledge development, and markets are still in an experimental or exploratory phase.

There are much more interesting experiments on various spaces at the niche level, for example rewilding projects, Paying for Ecosystem Services, regional eco-markets, adaptive management, knowledge sharing and covenant approaches (Darnhofer et al. 2014; Reid & Nsoh 2014; Runhaar et al 2016). In all these cases it is aimed to connect conservation with agricultural or other social interests, and may be considered to fit in the more or less positioned in the sharing tradition.

With respect to the third condition it can be said that new financial and institutional framework types to strengthen development at the niche level are not absent but currently still rare (De Snoo et al. 2016).

The fourth condition regards the the societal macro - landscape – level. Here we see contradictory developments. On the one hand, most agricultural institutions focus still on specialization, scaling-up, intensification, and world-market orientation. On the other hand, citizens ask for more products from sustainable small-scale, regionally based forms of agriculture. In addition, the European Council is working on proposals to set aside at least 5% of agricultural land for nature conservation purposes, and aims to establish rules for sustainable agriculture, although the current legal and financial incentives are still poor (De Snoo et al. 2016). Yet there is some legislation forcing farmers to look for more nutrient- and energy-efficient modes of production. Among ecologists and nature conservationists there is a call for more society-inclusive types of conservation and restoration (Mace 2014; Tallis & Lunchenko 2014).

All in all regime change or merging of regimes has not been realized yet, and governmental, market and scientific-technological approaches turned out to be rather persistent. But there is some room for new, land-sharing approaches for restoration and conservation as an alternative to the land-sparing divide between highly industrialized large farms and pristine wilderness preservation. At least in relatively extensively used agricultural areas, merging agricultural and nature protection regimes is possible. The maturing of these approaches will take quite some time and protected pioneering is still required.

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Figure 1: Schematic presentation of the multi-level perspective on societal transitions as applied in this article. The solid arrows represent influences between the different levels.

